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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. *(Previously Presented)* An encoder or decoder, comprising:

- first processing circuitry for calculating a discrete cosine transform (DCT) of length N/2, N being a positive, even integer, to produce two sequences of coefficients of length N/2, that represent the first and second half, respectively, of an original sequence of values of length N, and

second processing circuitry for calculating a DCT of length N directly from the two sequences of coefficients of length N/2.

2. *(Previously Presented)* An encoder or decoder comprising:

- first processing circuitry for calculating a discrete cosine transform (DCT) of length N/2 x N/2, N being a positive, even integer, to produce four sequences of coefficients, and

- second processing circuitry for calculating a DCT of length N x N directly from the four sequences of coefficients.

3. *(Previously Presented)* The encoder or decoder of claim 1, wherein the second processing circuitry for calculating DCT of length N is arranged to calculate the even coefficients of the DCT of length N as:

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$$X_{2k} = \sqrt{\frac{2}{N}} \varepsilon_{2k} \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)2k\pi}{2N}$$

$$= \sqrt{\frac{2}{N}} \varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} x_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{2}{N}} \varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos\left[\frac{[2(N-1-n)+1]k\pi}{2(N/2)}\right] \right\}$$

$$= \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{1}{2}} \left[Y_k + (-1)^k Z_k \right]$$

$$= \sqrt{\frac{1}{2}} \left[Y_k + Z'_k \right] \qquad k = 0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R'_k - R_{k-1}$$

where

$$R'_k = \sqrt{\frac{2}{N}} \left\{ \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N} \right\}$$

$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} (y_n - z'_n) 2\cos\frac{(2n+1)\pi}{2N} \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} r_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

or

$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \{ \text{ length-N/2 DCT-II of } r_n \}$$

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where

$$r_n = (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l(Y_l - Z'_l)\cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N}$$

$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of ($Y_l - Z'_l$), and where

$$R'_k = X_{2k+1} + X_{2k-1}.$$

or as

$$X_{2k+1} = \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1}x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1}x_i\cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1}x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1}y_i\cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1}z_i\cos\left[\frac{(2i+1)(2k+1)\pi}{2N}+(k\pi+\frac{\pi}{2})\right]\right\}.$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1}y_i\cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1}z_i\sin\frac{(2i+1)(2k+1)\pi}{2N}\right\}$$

$$= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,\ldots,(N/2)-1.$$

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4. *(Previously Presented)* An encoder or decoder of claim 1, wherein N is equal to 2^m,

m being a positive integer > 0.

5. *(Canceled).*

6. *(Canceled).*

7. *(Canceled).*

8. *(Canceled).*

9. *(Previously Presented)* A transcoder comprising the encoder or decoder of claim 1.

10. *(Previously Presented)* A system for transmitting DCT transformed image or video data comprising the encoder or decoder of claim 1.

11. *(Currently Amended)* A method of encoding a digitalized image in a compressed discrete cosine transform (DCT) domain using DCTs of length N/2, comprising:

undersampling compressed frames by a certain factor in each dimension, and

calculating a DCT of length N x N directly from four adjacent DCT coefficient ~~DCTs for four adjacent~~ blocks of size N/2 x N/2 of the digitalized image, N being a positive, even integer.

12. *(Previously Presented)* A method of encoding a digitalized image represented as a discrete cosine transform (DCT) transformed sequence of coefficients of length N, N being a positive, even integer, comprising:

calculating a DCT of length N directly from two sequences of coefficients of length N/2,

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wherein the two sequences of coefficients are obtained from DCTs of length N/2 and

represent the first half and second half, respectively, of an original sequence of digitalized

images values of length N.

13. *(Currently Amended)* A method according to claim 12, wherein the even coefficients

of the DCT of length N ~~is~~ are calculated as:

$$X_{2k} = \sqrt{\frac{2}{N}} \varepsilon_{2k} \sum_{n=0}^{N-1} x_n \cos \frac{(2n+1)2k\pi}{2N}$$

$$= \sqrt{\frac{2}{N}} \varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} x_n \cos \frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos \frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{2}{N}} \varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} y_n \cos \frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos \left[\frac{[2(N-1-n)+1]k\pi}{2(N/2)} \right] \right\}$$

$$= \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} y_n \cos \frac{(2n+1)k\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} z_n \cos \frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{1}{2}} \left[Y_k + (-1)^k Z_k \right]$$

$$= \sqrt{\frac{1}{2}} \left[Y_k + Z'_k \right] \qquad k = 0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R'_k - R_{k-1}$$

where

$$R'_k = \sqrt{\frac{2}{N}} \left\{ \sum_{n=0}^{N-1} x_n \cos \frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos \frac{(2n+1)(2k-1)\pi}{2N} \right\}$$

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$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}(y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}\cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}r_n\cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

or

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\{\text{ length-N/2 DCT-II of } r_n\}$$

where

$$r_n = (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Y_l\cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Z'_l\cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l(Y_l - Z'_l)\cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N}$$

$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of ($Y_l - Z'_l$), and where

$$R'_k = X_{2k+1} + X_{2k-1}.$$

or as

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$$X_{2k+1} = \sqrt{\frac{2}{N}} \varepsilon_{2k+1} \sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N}$$

$$= \sqrt{\frac{2}{N}} \left\{ \sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2} \cos\frac{(2i+N+1)(2k+1)\pi}{2N} \right\}$$

$$= \sqrt{\frac{2}{N}} \left\{ \sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi + \frac{\pi}{2}) \right] \right\}.$$

$$= \sqrt{\frac{2}{N}} \left\{ \sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1} \sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N} \right\}$$

$$= \sqrt{\frac{2}{N}} (X1_k - (-1)^k X2_k), \quad k = 0,1,...,(N/2) - 1.$$

14. *(Previously Presented)* The method of claim 11, wherein N is equal to 2^m, m being a positive integer > 0.

15. *(Previously Presented)* A method of decoding a digitalized image represented as a discrete cosine transform (DCT) transformed sequence of coefficients of length N, N being a positive, even integer, comprising:

calculating a DCT of length N from two sequences of coefficients of length N/2,

wherein the two sequences of coefficients represent the first half and second half, respectively, of an original sequence of digitalized image values of length N.

16. *(Previously Presented)* A method of decoding a digitalized image in the compressed discrete cosine transform (DCT) domain using DCTs of lengths N/2, comprising:

undersampling compressed frames by a certain factor in each dimension, and

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calculating a DCT of length N x N directly from DCTs for four adjacent blocks of sizes

N/2 x N/2 of the digitalized image, N being a positive, even integer.

17. *(Previously Presented)* The method of claim 15, wherein the even coefficients of the

DCT of length N are calculated as:

$$X_{2k} = \sqrt{\frac{2}{N}} \varepsilon_{2k} \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)2k\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} x_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos\left[\frac{[2(N-1-n)+1]k\pi}{2(N/2)}\right] \right\}$$

$$= \sqrt{\frac{1}{2}}\left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + (-1)^k Z_k\right]$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + Z'_k\right] \qquad\qquad k = 0,1,...,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R'_k - R_{k-1}$$

where

$$R'_k = \sqrt{\frac{2}{N}}\left\{ \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N} \right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}\cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

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$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} r_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

or

$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \{ \text{ length-N/2 DCT-II of } r_n \}$$

where

$$r_n = (y_n - z'_n) 2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{ \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)} \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{ \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l (Y_l - Z'_l) \cos\frac{(2n+1)l\pi}{2(N/2)} \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of ($Y_l - Z'_l$), and where

$$R'_k = X_{2k+1} + X_{2k-1}.$$

or as

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$$X_{2k+1} = \sqrt{\frac{2}{N}} \varepsilon_{2k+1} \sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N}$$

$$= \sqrt{\frac{2}{N}} \left[\sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2} \cos\frac{(2i+N+1)(2k+1)\pi}{2N} \right]$$

$$= \sqrt{\frac{2}{N}} \left\{ \sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi + \frac{\pi}{2})\right] \right\}.$$

$$= \sqrt{\frac{2}{N}} \left\{ \sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N} \right\}$$

$$= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,...,(N/2)-1.$$

18. *(Previously Presented)* The method of claim 15, N is equal to 2^m, m being a positive integer > 0.

19. *(Previously Presented)* A method of transcoding a digitalized image in the compressed discrete cosine transform (DCT) domain using DCTs of lengths N/2, comprising:

undersampling compressed frames by a certain factor in each dimension, and

calculating a DCT of length N x N directly from DCTs of length N/2 x N/2 for four

adjacent blocks of size N/2 x N/2 of the digitalized image, N being a positive, even integer.

20. *(Previously Presented)* An encoder comprising:

- means for performing discrete cosine transform (DCT) transformation of a sequence of

values of length N/2 to produce two sequences of coefficients of length N/2, N being a positive,

even integer, and

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- means for calculating the DCT of length N directly from the two sequences of

coefficients of length N/2 without having to calculate a DCT of length N,

wherein the two sequences of coefficients represent the first half and second half,

respectively, of an original sequence of values of length N.

21. *(Previously Presented)* A method of encoding a digitalized image represented as an

original sequence of values of length N, N being a positive, even integer, wherein the DCT of

length N is calculated directly from two sequences of coefficients obtained from DCTs of

sequence of values of length N/2 without having to calculate a DCT of length N, the two

sequences representing the first half and second half, respectively, of the original sequence of

values of length N.

22. *(Previously Presented)* A method of transmitting a bit stream representing a

digitalized image as a compressed video signal which includes coefficients obtained by

calculating DCTs for blocks of size N/2 x N/2, the blocks being obtained by dividing the

digitalized image, to a plurality of users, at least one of which requires a reduction of the bit

stream or down-scaling of the corresponding compressed video signal, the method comprising:

receiving in a transcoder the bit stream of the compressed video signal;

extracting from the received bit stream the coefficients for the blocks of size N/2 x N/2;

collecting the extracted coefficients for four adjacent blocks of size N/2 x N/2, the groups

of four adjacent blocks forming together non-overlapping blocks of size N x N in the digitalized

image;

calculating, from the collected coefficients, coefficients of the DCTs for the blocks of

size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length N

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or using DCTs and IDCTs for blocks of the size N/2 x N/2 and without using DCTs or IDCTs of

length N x N,

    selecting, from the calculated coefficients, coefficients of the lowest frequencies; and

    transmitting to the at least one user a bit stream including only the selected coefficients.

    23. *(Previously Presented)* A method of transmitting a bit stream representing a

digitalized image as a compressed video signal, which includes coefficients obtained by

calculating DCTs for blocks of size N x N, the blocks being obtained by dividing the digitalized

image, to a plurality of users, at least one of which requires a reduction of the bit stream or

down-scaling of the corresponding compressed video signal, the method comprising:

    receiving in a transcoder the bit stream of the compressed video signal;

    extracting, from the received bit stream, the coefficients for the blocks of size N x N;

    collecting the extracted coefficients for four adjacent blocks of size N x N, the groups of

four adjacent blocks forming together non-overlapping blocks of size 2N x 2N in the digitalized

image;

    selecting, from the collected, extracted coefficients for each block of size N x N of each

of the groups of four adjacent blocks of the size N x N, coefficients of N/2 x N/2 lowest

frequencies;

    calculating, from the selected coefficients for each of the groups, coefficients of the DCT

for a block of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or

IDCTs of length N or using DCTs and IDCTs for blocks of size N/2 x N/2 and without using

DCTs or IDCTs of length N x N, and

    transmitting to the at least one user a bit stream including only the calculated coefficients.

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24. *(Previously Presented)* The method of claim 23, wherein, in the step of calculating coefficients of DCTs for blocks of size N x N the even coefficients of a DCT of length N is calculated as:

$$X_{2k} = \sqrt{\frac{2}{N}} \varepsilon_{2k} \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)2k\pi}{2N}$$

$$= \sqrt{\frac{2}{N}} \varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} x_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{2}{N}} \varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos\left[\frac{[2(N-1-n)+1]k\pi}{2(N/2)}\right] \right\}$$

$$= \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)k\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{1}{2}} \left[Y_k + (-1)^k Z_k \right]$$

$$= \sqrt{\frac{1}{2}} \left[Y_k + Z'_k \right] \qquad k = 0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R'_k - R_{k-1}$$

where

$$R'_k = \sqrt{\frac{2}{N}} \left\{ \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N} \right\}$$

$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} (y_n - z'_n) 2\cos\frac{(2n+1)\pi}{2N} \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

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$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}} \varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} r_n \cos \frac{(2n+1)k\pi}{2(N/2)} \right\}$$

or

$$= \frac{1}{\varepsilon_k} \sqrt{\frac{1}{2}} \left\{ \text{length-}N/2 \text{ DCT-II of } r_n \right\}$$

where

$$r_n = (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{ \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l Y_l \cos \frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l Z'_l \cos \frac{(2n+1)l\pi}{2(N/2)} \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{ \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l (Y_l - Z'_l) \cos \frac{(2n+1)l\pi}{2(N/2)} \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-$N/2$ IDCT of ($Y_l - Z'_l$), and

$$R'_k = X_{2k+1} + X_{2k-1},$$

or as

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$$X_{2k+1} = \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1}x_i\cos\frac{(2i+1)(2\kappa+1)\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1}x_i\cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1}x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1}y_i\cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1}z_i\cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi+\frac{\pi}{2})\right]\right\}.$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1}y_i\cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1}z_i\sin\frac{(2i+1)(2k+1)\pi}{2N}\right\}$$

$$= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,...,(N/2)-1.$$

25. *(Previously Presented)* A transmission system for transmitting digitalized images where users are connected to each other through a multi-node control unit and bit streams of digitalized images corresponding to compressed video signals are transmitted between the users, the compressed video signal including coefficients obtained by calculating discrete cosine transforms (DCTs) for blocks of size N/2 x N/2 obtained by dividing the digitalized image,

- a first one of the users, for receiving a bit stream transmitted from a second one of the users, requiring a reduction of the bit stream or down-scaling of the corresponding compressed video signal,

the multi-node control unit comprising:

- means for receiving said bit stream from the second one of the users and for extracting from the bit stream coefficients for blocks of size N/2 x N/2 in a corresponding digitalized image;

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 - means for collecting the extracted coefficients for four adjacent blocks of size

N/2 x N/2;

 - means for calculating from the collected coefficients coefficients for a DCT for a block

of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length

N or using DCTs and IDCTs for blocks of size N/2 x N/2 and without using DCTs or IDCTs of

length N x N;

 - means for selecting, from the calculated coefficients, coefficients for the lowest

frequencies, and

 - means for transmitting to the first one of the users a bit stream including only the

selected coefficients.

 26. *(Previously Presented)* A transmission system for transmitting digitalized images,

the system including users connected to each other through a multi-node control unit,

 - bit streams of digitalized images being compressed video signals being transmitted

between the users, the compressed video signal for a digitalized image comprising coefficients

obtained by calculating DCTs for blocks of size N x N obtained by dividing the digitalized

image,

 - a first one of the users, for receiving a bit stream transmitted from a second one of the

users, requiring a reduction of the bit stream or down-scaling of the corresponding compressed

video signal,

 the multi-node control unit comprising:

 - means for receiving said bit stream from the second one of the users and for extracting

from the bit stream coefficients for blocks of size N x N in a corresponding digitalized image;

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- means for collecting the extracted coefficients for four adjacent blocks of size N x N;

- means for selecting, from the extracted coefficients for each of the four adjacent blocks, coefficients for N/2 x N/2 lowest frequencies;

- means for calculating, from the selected coefficients, coefficients for a DCT for a block of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length N or using DCTs and IDCTs for blocks of size N/2 x N/2 and without using DCTs or IDCTs of length N x N; and

- means for transmitting to the first one of the users a bit stream including only the calculated coefficients. --

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